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An Evaluation of MTC Specifications for Tree Planting and Maintenance Techniques

Interim Report 2



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An Evaluation of MTC Specifications for Tree Planting and Maintenance Techniques, Interim Report 2

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Abstract:	This report documents year two of the joint MTC/University of Guelph study on tree planting and maintenance techniques. Data for trunk caliper, shoot elongation, canopy density, leaf water potential, defoliation date, soil moisture, soil temperature, and soil hydraulic conductivity were collected. The trial consists of two species, Colorado spruce (<i>Picea pungens</i>) and green ash (<i>Fraxinus pennsylvanica</i> var <i>lanceolata</i>) planted in the spring of 1985 on the west side of Highway 86 just south of Regional Road 17 near the village of St. Jacobs. Treatments include backfill, pruning, mulching, weed control, and staking. As the growing season progressed it became evident that the Colorado spruce were growing very poorly and many trees were dead. The trees that were alive had too little growth to provide reliable data for the 1986 season. The spruce segment of the study was therefore abandoned.
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OVERVIEW AND METHODOLOGY

This report documents year two of the joint MTC/U. of G. study on tree planting and maintenance techniques. Data were collected for trunk caliper, shoot elongation, canopy density, leaf water potential, defoliation date, soil moisture, soil temperature and soil hydraulic conductivity.

The trial consists of two species, green ash (Fraxinus pennsylvanica var lanceolata) and Colorado spruce (Picea pungens) planted in the spring of 1985 on the west side of Highway 86 just south of Regional Road 17 near the village of St. Jacobs.

The specific treatments are:

1. backfill
 - a) top soil and peat - as currently in specs
 - b) unamended site clay sub soil
 - c) equal parts of a) and b)
2. pruning
 - a) none
 - b) "to compensate for root loss" - as currently in specs -
one third of all lateral growth removed at planting
3. mulching/weed control
 - a) 100 mm of wood chips - as currently in specs
 - b) herbicide weed-free ring
 - c) no surface treatment

4. staking

- a) 75 cm height, 1 year duration
- b) 75 cm height, 3 year duration
- c) 150 cm height, 1 year duration
- d) 150 cm height, 3 year duration

At the beginning of the growing season stakes were removed from those trees designated for one year duration. Also, the weed free ring was maintained with herbicide. The rodent protection screens at the base of the ash trees were causing some trunk rubbing. Protective wrapping eliminated the problem. An unusual insect (lappet moth) was found on some of the ash trees but it apparently caused no injury. Canopy density was assessed in July, shoot elongation monthly and trunk diameter at 80 and 160 cm height in October.

RESULTS

As the growing season progressed it became evident that the Colorado spruce were growing very poorly and many trees were dead. This was the combined result of an inferior root system on the purchased trees, improper transportation to the site in 1985 causing many broken leaders and winter damage at the site. The trees that were alive had too little growth to provide reliable data for the 1986 season. Upon consultation with MTC staff we decided to abandon the spruce segment of the study. The trees were allowed to remain on the site but were neither maintained nor measured.

Weather Data

Precipitation summaries were acquired from the Environment Canada Weather Office at the Waterloo-Wellington Airport. The months of May

through October had above normal precipitation with June, August and September being unusually high. April and November precipitation was slightly below normal (Fig. 1 and 2). As a result of the above normal rainfall during the summer the soil was usually wet to moist. Visual observation indicated no possibility of insufficient moisture during the growing season.

Soil - Temperature and Moisture Relations

Temperatures at two different levels (surface and 15 cm below the surface) were similar to those in 1985. Surface temperatures were highest for the wood chip mulch. There was little difference at the 15 cm depth regardless of the surface treatment.

Tensiometer readings of available soil moisture indicated high levels throughout the season. Because of the unusually wet summer and the clay soil at the site the trees were never in deficit soil moisture conditions. In fact there was standing water around the trees on a number of occasions.

In an attempt to better understand water movement in the soil at the site we used a permeameter developed in the Department of Land Resource Science. The apparatus measures hydraulic conductivity. It was used in the top soil and also in the clay sub soil. As would be expected hydraulic conductivity was much higher in the top soil than in the clay sub soil. Values were unusually erratic indicating that water movement through the soil occurred in fracture planes which is typical of a non homogeneous constructed fill profile.

Leaf Water Potential

Because of the quantity of precipitation during the summer

measurements indicated that leaf water content was very high and that there was no water stress, in fact an overabundance of water. As a result there were no treatment differences.

Shoot Elongation

Measurements of shoot elongation during 1986 were incomplete as a result of a sampling error. For this reason twigs will be measured in 1987 prior to the resumption of vegetative growth.

Canopy Density Rating

Canopy density is a function of both shoot growth and leaf development. During 1986 there were no differences in canopy density as a result of soil amendment (Fig. 3) or initial pruning treatments. In 1985 trees in amended backfill had higher canopy density ratings than non or half amended backfill. The 1986 results indicate that differences in the establishment year due to physical conditions of the backfill have disappeared.

Trunk Diameter

Measurements of trunk diameter were used to calculate change in trunk taper. Values are expressed in millimeters of diameter per meter of trunk length over the growing season. Increasing values indicate greater trunk development, being greater at the base and tapering with height.

As in 1985 the block in which the trees were growing had a significant effect on trunk development (Fig. 4). Trees in block a grew most and in block c least. These differences are still unexplained. If differences were related to growing conditions in the three blocks then one would expect canopy density and defoliation dates to be different. However, they were not.

In contrast to 1985 neither soil amendment nor staking treatments had any effect on differences in trunk taper (Fig. 5 and 6). Some tree stakes were removed in early 1986. For the tall stakes (150cm) removal resulted in a trend to more (but non-significant) trunk taper growth, resulting in values similar to unstaked trees. This trend is consistent with findings in the literature. Trees with low stakes (75 cm) reacted opposite to those with tall stakes. This is an unexplained result.

Unlike 1985, in 1986 there were no negative values for taper change. This indicates that normal trunk development was occurring (greater at lower height).

Defoliation

Visual observations during September and early October indicated that defoliation was not affected by soil amendment treatment (Fig. 7). In 1985 there was greater defoliation on some dates for the amended backfill. Increased root growth in 1986 may have negated the postulated adverse soil aeration effects on the root system in the first year.

Summary

In 1986, the second growing season of this trial, soil amendment, staking, top pruning at planting or mulch/weed control had no effect on tree growth. The block in which the trees grew had an effect on trunk diameter growth but on no other parameter. The lack of treatment differences in 1986 indicated that soil and plant parameters were not altering growth.

ACKNOWLEDGEMENTS

We thank Cathy Hunter for collecting field data and MTC staff of the Stratford District for this continued cooperation.

Fig. 1 Monthly precipitation summary for April to December 1986.

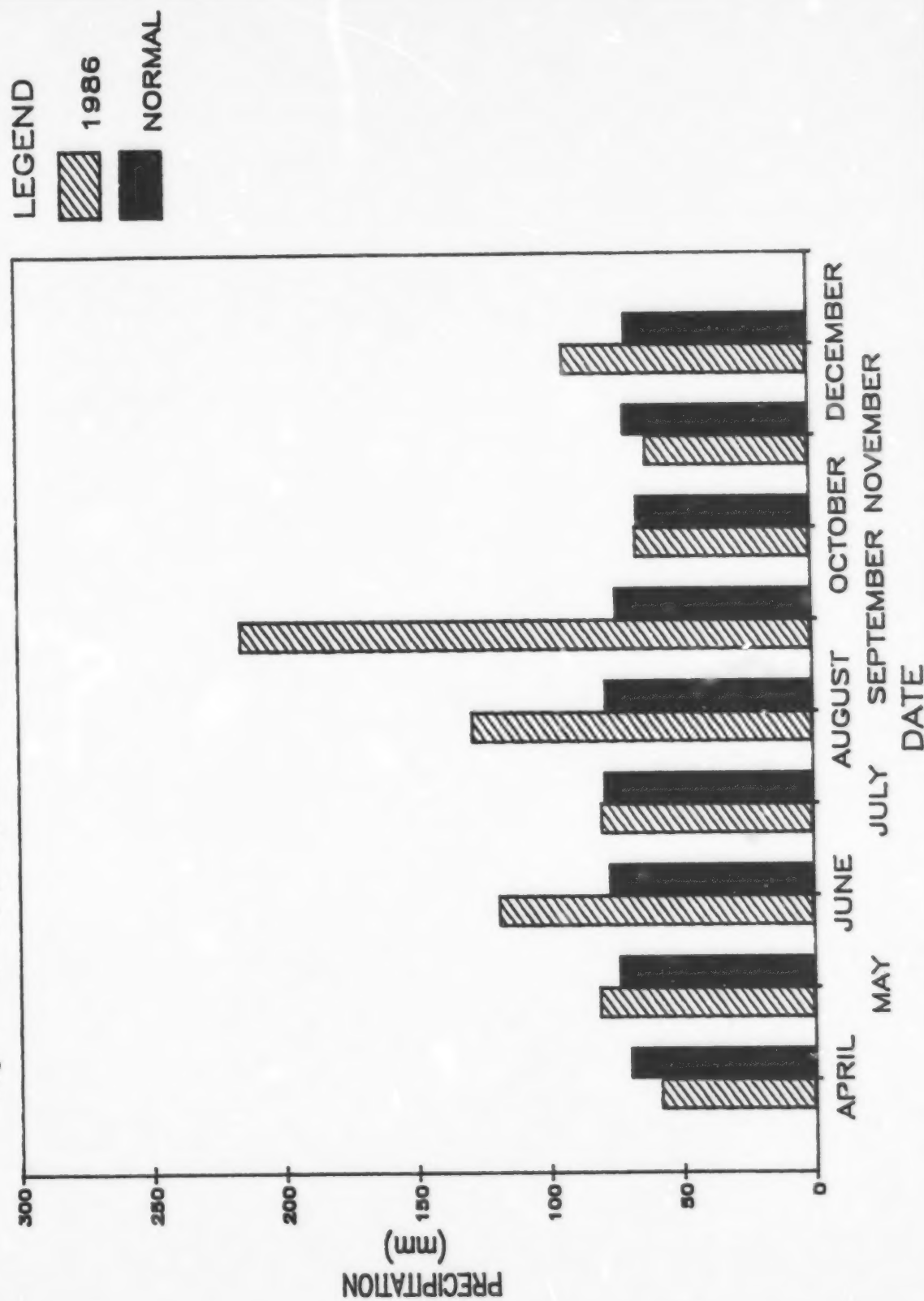


Fig. 2 Cumulative precipitation summary for April to December 1986.

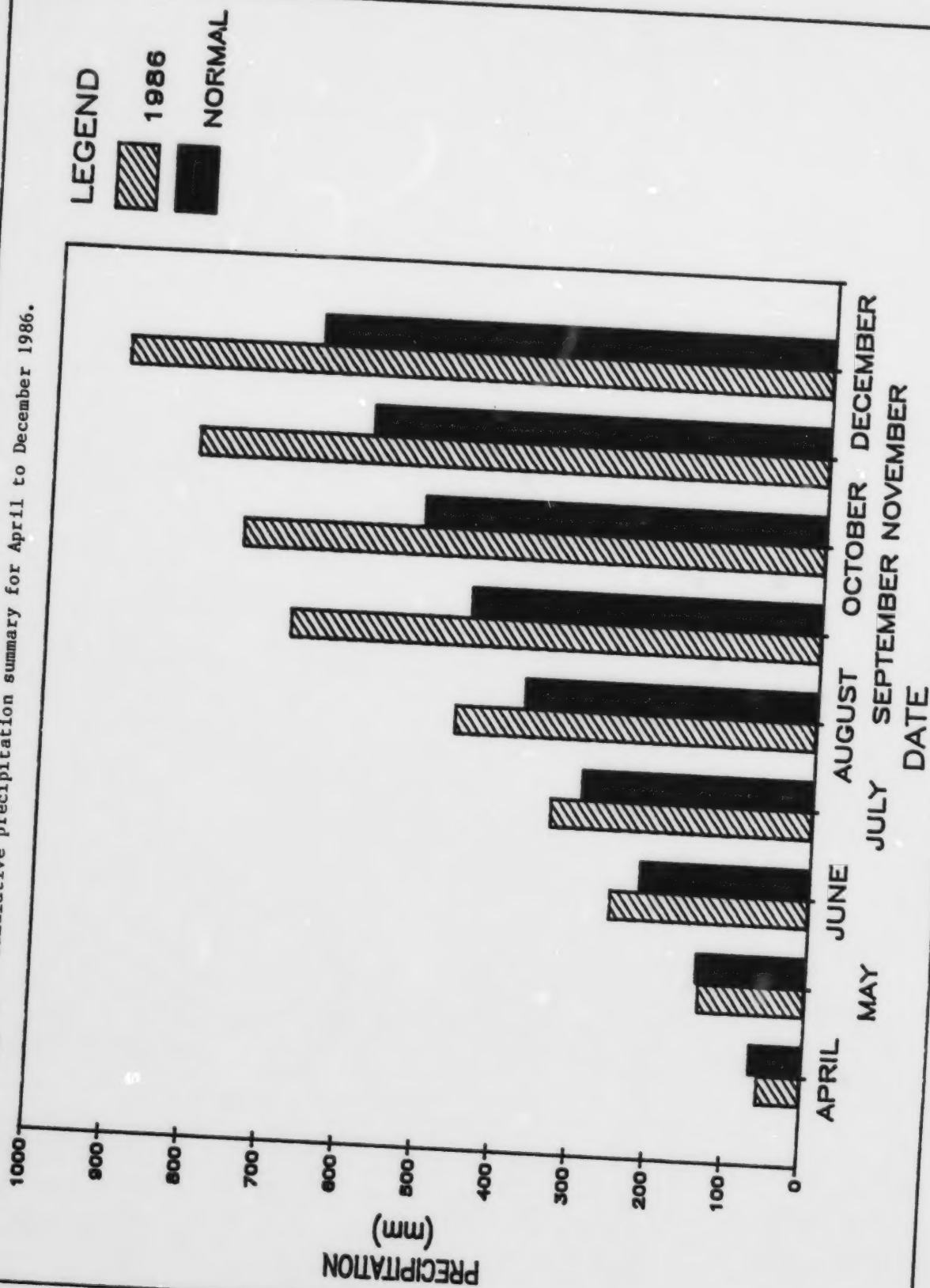


Fig. 3 Visual assessment of the canopy density of ash trees for each backfill treatment; scored on a scale of 0 to 5 (0 = dead, 5 = best). The three treatments are not different.

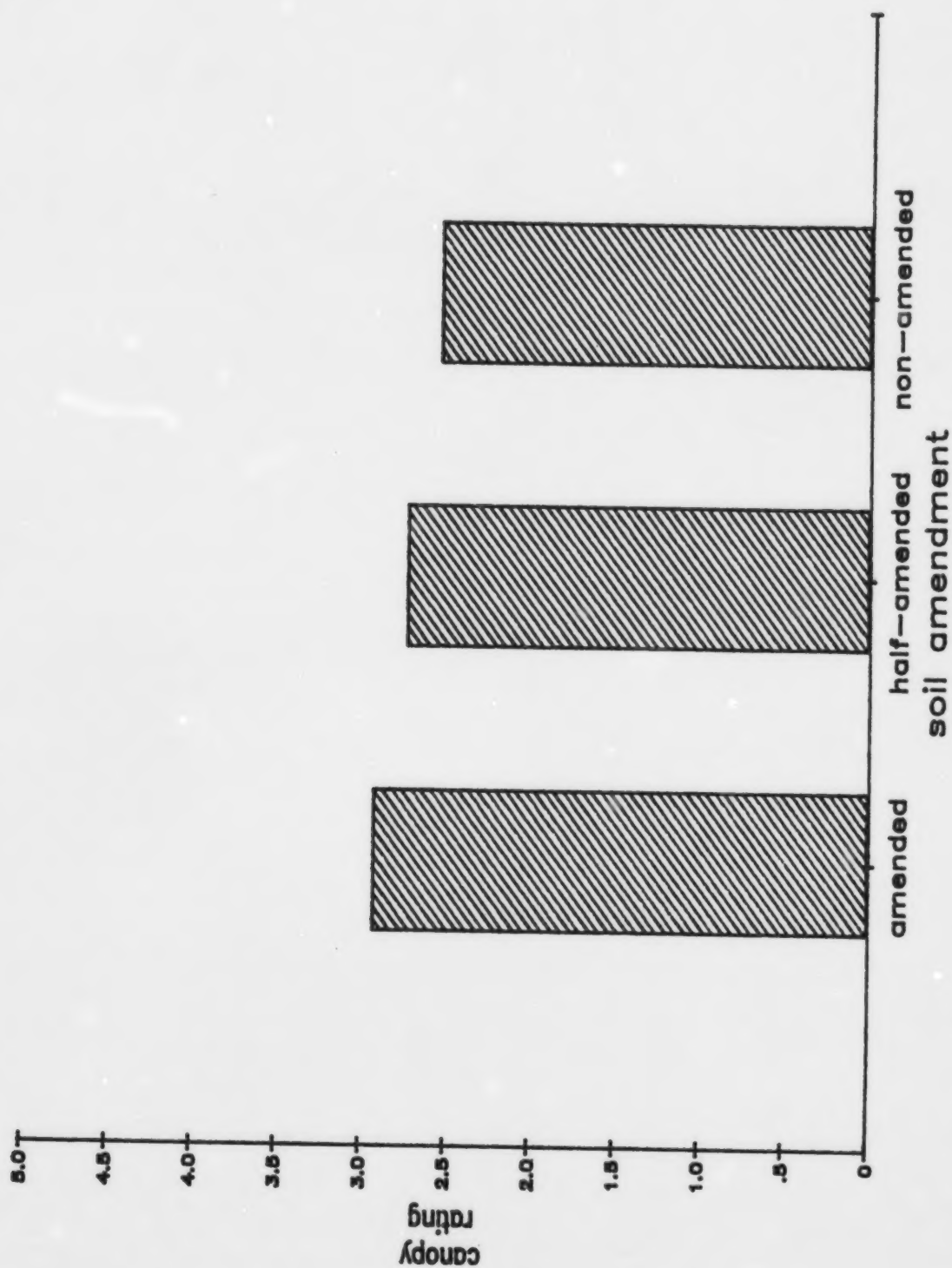


Fig. 4 Change in taper of ash tree trunks as influenced by location of block. Higher values indicate greater trunk growth. Each block is significantly different.

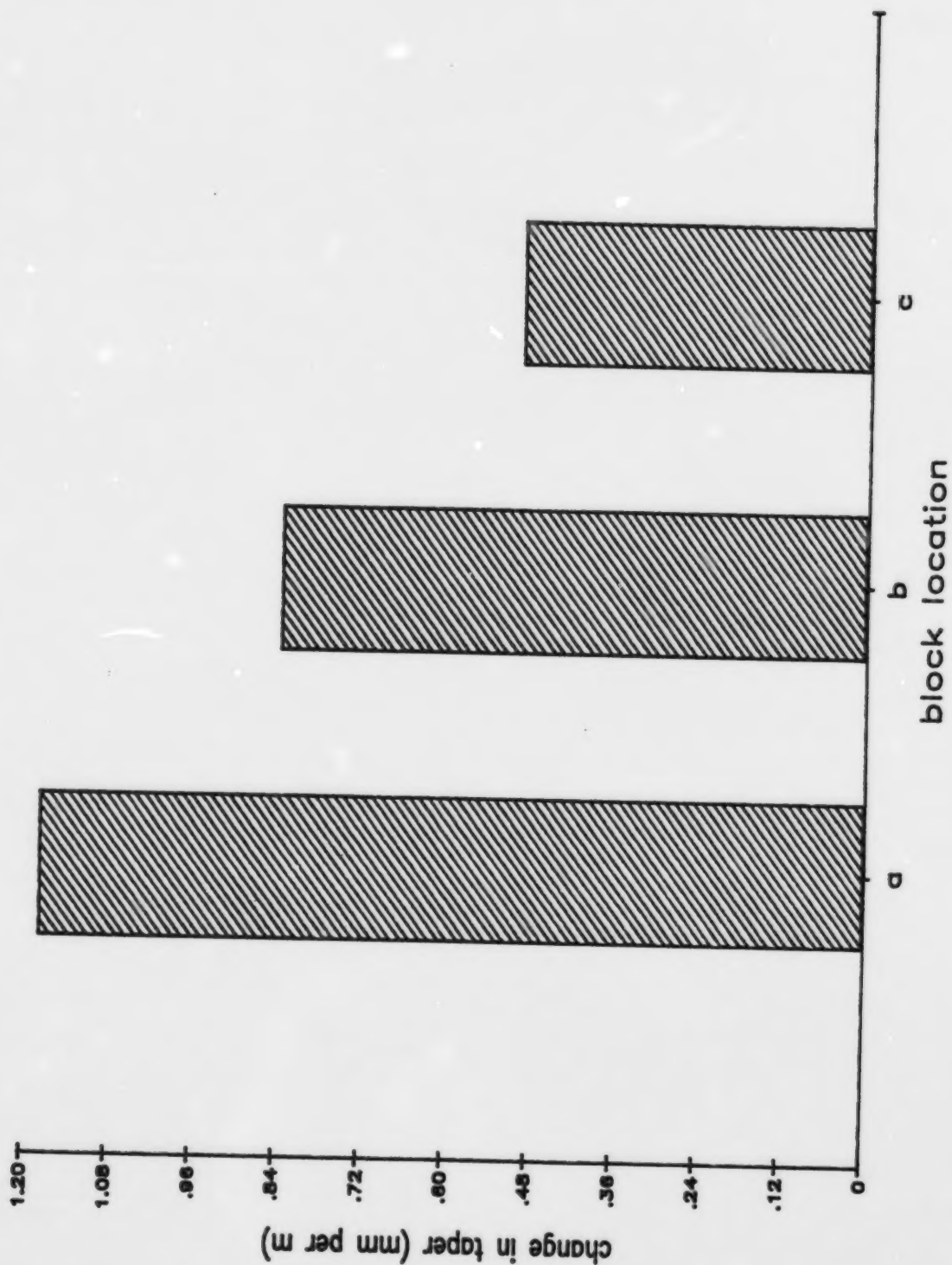


Fig. 5 Change in taper of ash tree trunks as influenced by soil amendment treatment. There is no difference among the treatments.

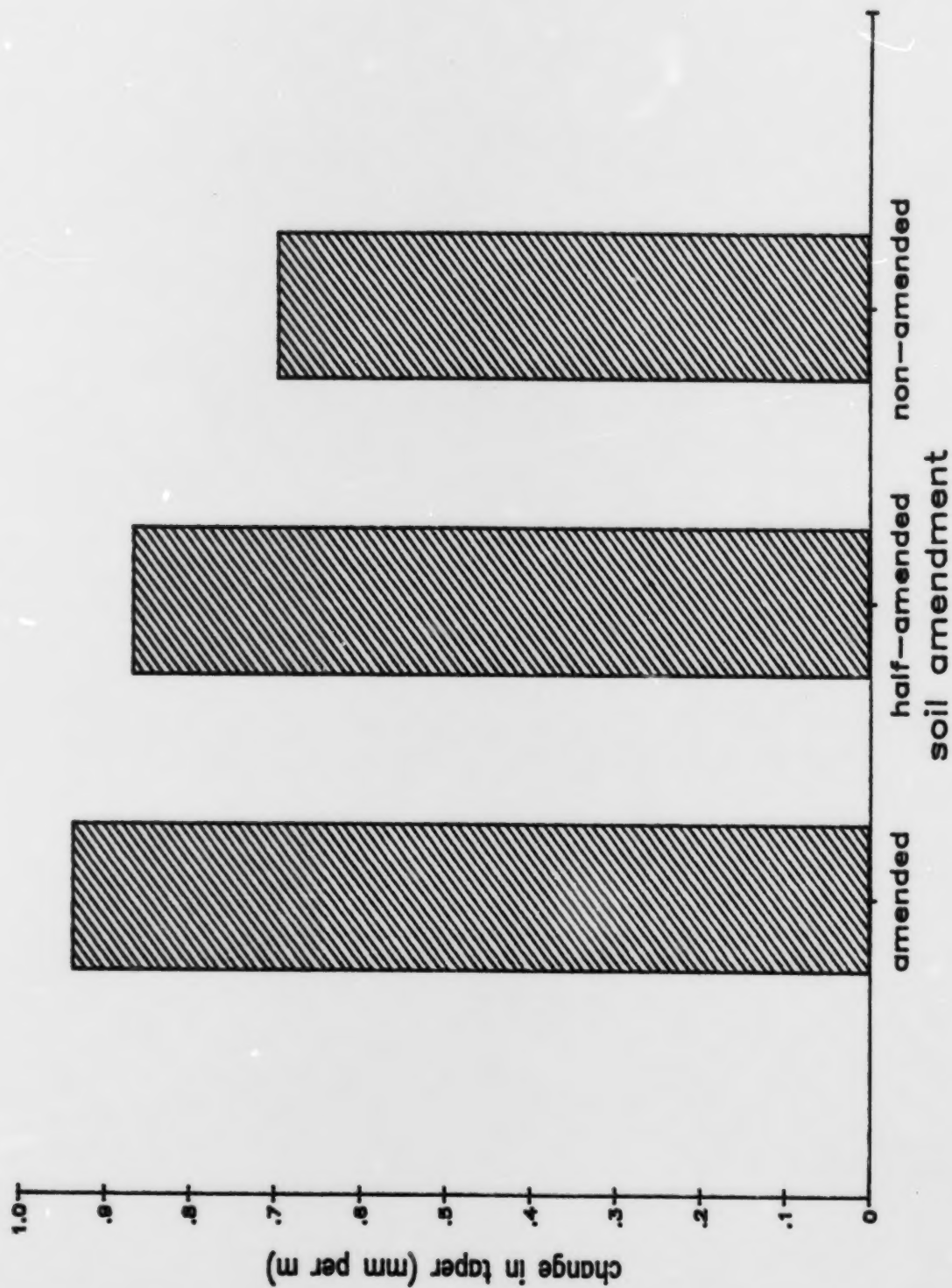


Fig. 6 Change in taper of ash tree trunks as influenced by staking treatment. There is no significant difference among the treatments.

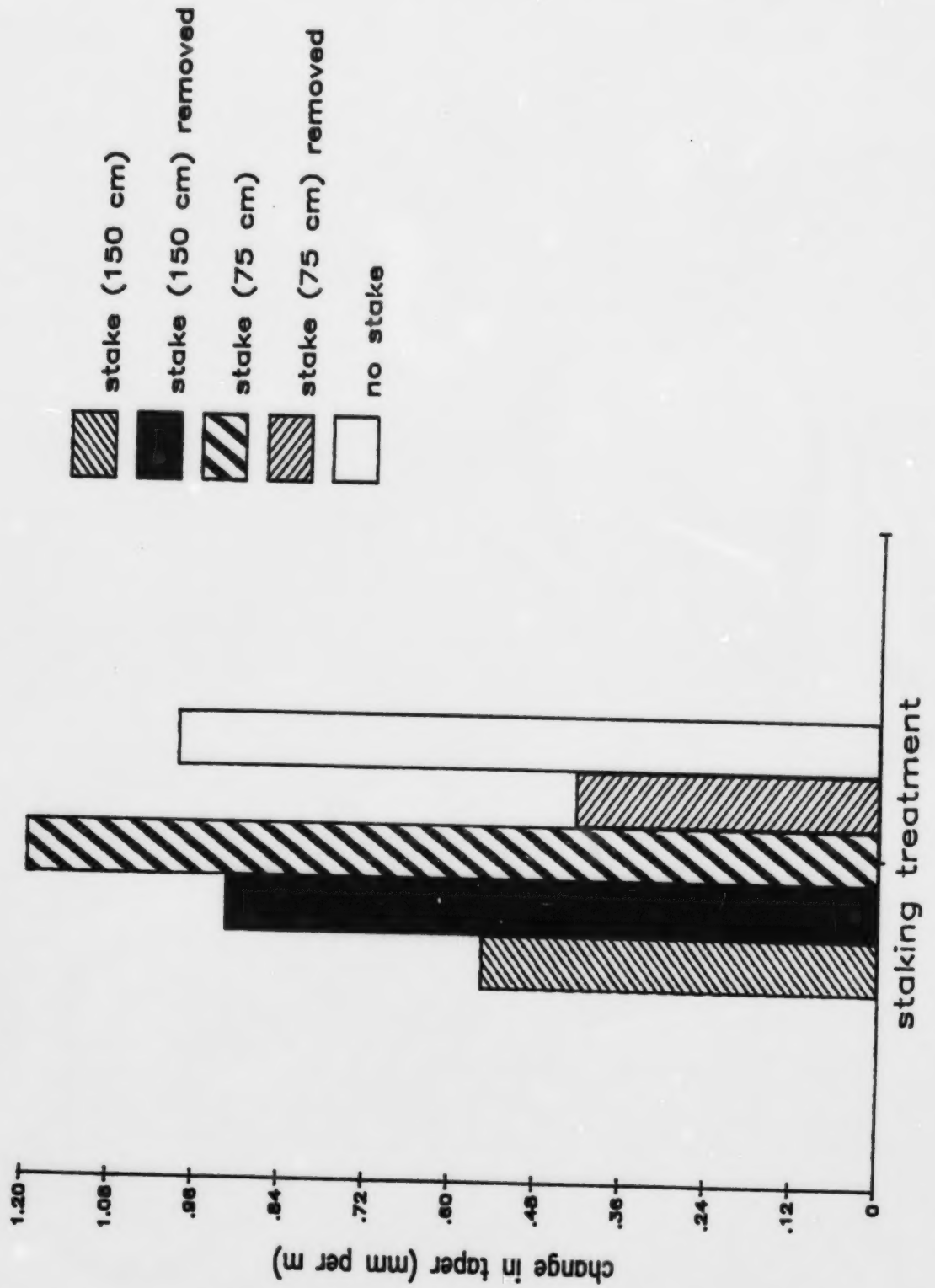


Fig. 7 Percent defoliation of ash trees as influenced by soil amendment treatment. There is no difference among the treatments.

